

UNPUBLISHED PRELIMINARY DATA
ELECTRONIC SYSTEMS LABORATORY
DEPARTMENT OF ELECTRICAL ENGINEERING

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE 39, MASSACHUSETTS UNIVERSITY 4-6900

J. FRANCIS REINTJES, Director
GEORGE C. NEWTON, Jr., Associate Director
JOHN E. WARD, Assistant Director
RICHARD A. OSBORNE, Executive Officer

November 17, 1964

Dr. T. L. K. Smull
Office of Research Grants and Contracts
National Aeronautics and Space Administration
Washington, D.C. (20546)

N 65-80754

Chick Stone

Dear Dr. Smull:

SUBJECT: Research Grant NSG-234-61, "Venus
Radar Systems Investigations"

This letter status report is being submitted in accordance with terms of the above research grant. The period covered is May 1, 1964 through October 31, 1964.

The breadboard model of our radar instrument is 75 per cent complete, but because of delays in delivery of certain components, we are three to four months behind the schedule we established for ourselves. A crystal-filter bank is two months overdue, and high-power 400-volt switching transistors needed for the modulator and promised for delivery in September have just arrived. The performance capability of these transistors is still unknown and it may be necessary for us to employ a backup modulator in the instrument.

Work is underway on a signal simulator for measuring the over-all system sensitivity. We are also undertaking development of micropower switching circuits for generating various gating and switching signals in the system. Since these circuits will probably operate continuously, low power drain is mandatory in order to avoid need for excessive system power requirements. Examples of circuits being developed include a one-shot multivibrator with quiescent power consumption of approximately twenty-five microwatts and a free-running multivibrator which can be used as a clock and which requires less than one milliwatt of input power. A low-power d-c to d-c power converter with an efficiency in excess of 80 per cent is also being developed.

With respect to the major parts of the instrument which are on hand and operating, the following experience data have been accumulated. The Varian VA-869A X-band crystal oscillator has, in general, performed satisfactorily. The Varian VA-869A X-band crystal oscillator has, in general, performed satisfactorily. The Varian VA-869A X-band crystal oscillator has, in general, performed satisfactorily.

COPIES OF THIS LETTER

November 17, 1964

tube for a total of ninety-eight hours. The two crystal-oscillator, varactor harmonic generators performed satisfactorily for twenty hours, at which time one unit failed. The solid-state microwave receiving system, which includes a low-noise receiver using a tunnel-diode amplifier, an image-rejection filter, a balanced mixer and an i-f amplifier with automatic gain control, performed satisfactorily for twenty-five hours, at which time the tunnel diode apparently failed. It should be borne in mind that, for the breadboard model, no environmental specifications other than temperature requirements were imposed on the subsystems.

A critical review of the program under which our major components were specified, procured from outside vendors, and evaluated indicates that additional effort on our part is needed during the procurement period. Although our technical specifications have been detailed, we feel that it is necessary to follow a subsystem through design and construction (at the supplier's facility if possible). In one instance where this procedure was followed, an incorrect amplifier bandwidth and an improperly designed AGC circuit were detected before delivery of the unit. In another instance, where a unit was not followed closely, it was discovered after delivery that it operated at a frequency other than that specified. It was also necessary to return a ferrite circulator to a supplier because it did not meet the specified isolation at the specified operating frequency.

Our experience is that suppliers have been eager to rectify their errors and also to correct failures after we have placed their units into operation. However, very few of our suppliers have met promised delivery dates, and design errors and failures in their products have slowed down the progress of our program.

During the next six-month interval, we expect to complete the breadboard model of the radar instrument and proceed with tests and evaluations.

Sincerely yours,

J. F. Reintjes
J. F. Reintjes

JFR:mb

cc. Dr. E. Gaugler
Mr. F. Barath